

# Deepak RAVIKUMAR

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I am currently an Applied Scientist II at Amazon, having earned my Ph.D. from Purdue University (ECE) with a specialization in Trustworthy AI. My research, published in premier venues including ICML, ICLR, NeurIPS, AAAI, and VLDB, has been honored with multiple accolades, such as the Estus H. and Vashti L. Magoon Research Excellence Award, Spotlight ( $\approx$  top 2%) at NeurIPS and ICML, and the Purdue ECE Summer Research Grant. I have also received the Purdue Teaching Excellence Award and a Bronze Medal for academic excellence during my Bachelor's degree.

## EDUCATION

<b>Electrical and Computer Engineering — <i>Ph.D.</i></b> Purdue University, West Lafayette, Indiana, USA	MAY 2019 - JUN. 2025 GPA: 3.93/4.00
<b>Electrical and Computer Engineering — <i>M.S.</i></b> Purdue University, West Lafayette, Indiana, USA	AUG. 2017 - MAY 2019 GPA: 4.00/4.00
<b>Electronics and Communications Engineering — <i>B.E.</i></b> M.S. Ramaiah Institute of Technology, Bangalore, Karnataka, India	AUG. 2012 - JUN. 2016 GPA: 9.74/10.00

## EXPERIENCE

<b>Applied Scientist II — <i>Amazon, Seattle</i></b> • Served as lead for a new model architecture powering core seller lifecycle models. Worked with the team delivered consistent offline metric gains across multiple use cases and drove production adoption for one high-impact workflow. • Integrated unstructured text data streams into seller lifecycle modeling by leveraging LLMs. Produced a seller embedding and showed that text-only signals add strong predictive power for downstream applications.	JUL. 2025 - PRESENT
<b>Research Assistant — <i>Purdue University, West Lafayette</i></b> <i>Advisor: Prof. Kaushik Roy</i> • Researched Deep Learning security and robustness, specifically out-of-distribution detection, adversarial attacks, differential privacy and memorization in deep vision models and LLMs. • Mentored Undergraduate researchers and collaborated with peers to research memorization and privacy in deep neural networks. • Was the teaching faculty for Advanced C Programming (ECE 264, Summer '18) and VLSI Design (Fall '20). Was the head TA for Microprocessor System Design (ECE 362), managed $\approx$ 25 lab staff, and designed coursework for the labs.	JAN. 2018 - JUN. 2025
<b>Machine Learning Research Intern — <i>Aizenn Corporation, West Lafayette</i></b> <i>Host: Dr. Chamika Liyanagedera</i> • Researched time series based forecast for PD fault detection using transformer model. Helped towards a multi-million dollar contract. • Utilized React, Docker, Node.js, and Apache deployed on AWS ECS to deliver an efficient and scalable solution. • Addressed and resolved challenges related to remote data acquisition and analytics, ensuring seamless functionality and performance.	JUL. 2024 - AUG. 2024
<b>Machine Learning Intern — <i>Microsoft Corporation, Redmond</i></b> <i>Host: Dr. Yiwen Zhu and Alex Yeo</i> • Researched and deployed Time Series Machine Learning model and pipeline for forecasting Azure Spark usage patterns using python and Cosmos DB. The deployed model saved several million dollars in running costs. • Filed for a patent on the findings and published the paper at a top tier venue.	MAY 2022 - AUG. 2022
<b>Software Engineer — <i>National Instruments Corporation, Bangalore</i></b> • Developed new capabilities and added features to a high precision data acquisition tool and its infrastructure using WPF and .NET. • Improved product performance (improved latency and removed memory leaks) and developed an onboarding program to train interns and new hires on the software and hardware infrastructure.	JUN. 2016 - JUL. 2017
<b>Software Engineering Intern — <i>National Instruments Corporation, Bangalore</i></b> • Prototyped new features for NI's high precision measurement tools and pushed code into production.	JAN. 2016 - JUN. 2016

## PUBLICATIONS

- Deepak Ravikumar, Efstatia Souflieri, Abolfazl Hashemi, and Kaushik Roy. “Memorization Through the Lens of Sample Gradients”, **International Conference on Learning Representations (ICLR) 2026**.
- Deepika Sharma, Deepak Ravikumar, Chih-Hsing Ho, Sangamesh Kodge and Kaushik Roy “Late Breaking Results: Input Loss Curvature as a Predictor of Sample Vulnerability to Hardware-Noise”, **DATE 2026**.
- Amitangshu Mukherjee, Deepak Ravikumar, and Kaushik Roy “From Clutter to Clarity: Visual Recognition through Foveated Object-Centric Learning (FocL)”, **Transactions on Machine Learning Research (TMLR) 2026**.

- Deepak Ravikumar, Efstathia Souflieri, Abolfazl Hashemi, and Kaushik Roy. “Towards Memorization Estimation: Fast, Formal and Free”, **International Conference on Machine Learning (ICML) 2025**.
- Amitangshu Mukherjee, Deepak Ravikumar, and Kaushik Roy “From Clutter to Clarity: Visual Recognition through Foveated Object-Centric Learning (Focl)”, **Reliable ML Workshop NeurIPS 2025**.
- Manish Nagaraj, Deepak Ravikumar, and Kaushik Roy “Coresets from Trajectories: Selecting Data via Correlation of Loss Differences”, **Transactions on Machine Learning Research (TMLR) 2025**.
- Deepak Ravikumar, Jimmy Gammell, and Kaushik Roy. “Building Resilient AI: Strengthening Data, Security, and Robustness in Neural Networks”, **International Symposium on On-Line Testing and Robust System Design (IOLTS) 2025**.
- Deepak Ravikumar, Efstathia Souflieri, Kaushik Roy, “Improved Out-of-Distribution Detection with Additive Angular Margin Loss.” **IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops, (CVPR Workshop) 2025**.
- Sangamesh Kodge, Deepak Ravikumar, Gobinda Saha, and Kaushik Roy. “SAP: Corrective Machine Unlearning with Scaled Activation Projection for Label Noise Robustness”, **Annual AAAI Conference on Artificial Intelligence (AAAI) 2025**.
- Deepak Ravikumar, Efstathia Souflieri, and Kaushik Roy. “Curvature Clues: Decoding Deep Learning Privacy with Input Loss Curvature”, **Neural Information Processing Systems (NeurIPS) 2024, Spotlight (Top 2%)**.
- Deepak Ravikumar, Efstathia Souflieri, Abolfazl Hashemi, and Kaushik Roy. “Unveiling Privacy, Memorization, and Input Curvature Links”, **International Conference on Machine Learning (ICML) 2024**.
- Isha Garg, Deepak Ravikumar, and Kaushik Roy. “Memorization through the lens of curvature of loss function around samples”, **International Conference on Machine Learning (ICML) 2024, Spotlight (Top 3.5%)**.
- Deepak Ravikumar, Alex Yeo, Yiwen Zhu, Aditya Lakra, Harsha Nagulapalli, Santhosh Ravindran, Steve Suh et al. “Intelligent Pooling: Proactive Resource Provisioning in Large-scale Cloud Service.” **Proceedings of the VLDB Endowment 17**, no. 7 (2024): 1618-1627.
- Deepak Ravikumar, Gobinda Saha, Sai Aparna Aketi, and Kaushik Roy. “Homogenizing non-iid datasets via in-distribution knowledge distillation for decentralized learning.” In 2024 **Transactions on Machine Learning Research (TMLR)**.
- Efstathia Souflieri, Deepak Ravikumar, and Kaushik Roy. “DP-ImgSyn: Dataset Alignment for Obfuscated, Differentially Private Image Synthesis”, In 2024 **Transactions on Machine Learning Research (TMLR)**.
- Deepak Ravikumar, Sangamesh Kodge, Isha Garg, and Kaushik Roy. “Intra-class mixup for out-of-distribution detection.” **IEEE Access 11** (2023): 25968-25981.
- Deepak Ravikumar, Sangamesh Kodge, Isha Garg, and Kaushik Roy. “TREND: Transferability-Based Robust ENsemble Design.” **IEEE Transactions on Artificial Intelligence 4**, no. 3 (2022): 534-548.
- Deepak, R., Akshay K. Kallianpur, M. V. Bharath, and K. Shreedarshan. “Quadrature carrier multiplexing based digital video compression.” In 2016 Second International Conference on Research in Computational Intelligence and Communication Networks (ICRCICN), pp. 1-5. IEEE, 2016.
- Deepak, R., Abhishek Vasant Nayak, and K. Manikantan. “Ear detection using active contour model.” In 2016 International Conference on Emerging Trends in Engineering, Technology and Science (ICETETS), pp. 1-7. IEEE, 2016.

## PREPRINT

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- Efstathia Souflieri, Deepak Ravikumar, Jimmy Gammell, Eleni Saka, and Kaushik Roy. “Towards Memorization Estimation in LLMs: Detecting Pretraining Data in Generated Sequences”, **preprint 2026**.
- Hyunwoo Yoo, Efstathia Souflieri, Deepak Ravikumar, and Gail Rosen. “A Bidirectional Generative Framework for Multimodal Biological Classification”, **preprint 2025**.
- Srihari Sridharan, Deepak Ravikumar, Anand Raghunathan and Kaushik Roy. “GradientSpace: Unsupervised Data Clustering for Improved Instruction Tuning”, **preprint 2025**.
- Manish Nagaraj, Sakshi Choudhary, Utkarsh Saxena, Deepak Ravikumar, and Kaushik Roy. “TRIM: Token-wise Attention-Derived Saliency for Data-Efficient Instruction Tuning”, **preprint 2025**.
- Praditha Malinga Alwis, Soumyadeep Chandra, Deepak Ravikumar, and Kaushik Roy. “Loss Knows Best: Detecting Annotation Errors in Videos via Loss Trajectories”, **preprint 2025**.
- Pranav Ramesh, Deepak Ravikumar, Arjun Roy, Gopalakrishnan Srinivasan and Kaushik Roy. “Coreset Selection for Adversarial Robustness”, **preprint 2025**.
- Timur Ibrayev\*, Deepak Ravikumar\*, Manish Nagaraj, Amogh Joshi and Kaushik Roy “Vis-A-ViQA: A Dataset of Task-Driven Human Visual Attention in Video Question Answering”, **preprint 2025**.
- Manish Nagaraj, Deepak Ravikumar, Efstathia Souflieri, and Kaushik Roy. “Finding the Muses: Identifying Coresets through Loss Trajectories”, **preprint 2025**.
- Efstathia Souflieri, Deepak Ravikumar, and Kaushik Roy. “Advancing Compressed Video Action Recognition through Progressive Knowledge Distillation.” **CoRR preprint arXiv:2407.02713, 2024**.
- Deepak Ravikumar, and Kaushik Roy. “Norm-scaling for out-of-distribution detection.” **CoRR preprint arXiv:2205.03493, 2022**.

## PATENTS

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- Zhu, Yiwen, Alex Yeo, Harsha Nihanth Nagulapalli, Sumeet Khushalani, Arijit Tarafdar, Subramaniam Venkatraman Krishnan, Deepak Ravikumar et al. “Proactive resource provisioning in large-scale cloud service with intelligent pooling.” U.S. Patent Application 18/152,391, filed Jul. 11, 2024.

## AWARDS

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- 2025 Estus H. and Vashti L. Magoon Research Excellence Award
- 2024 NeurIPS Spotlight Paper (Top 2%)

- 2024 ICML Spotlight Paper (Top 3.5%)
- 2020 Recipient of Purdue ECE Summer Research Grant
- 2019 Recipient of Magooon Award for Teaching excellence at Purdue University
- 2017 Awarded for being one of the top 3 best papers at National Instruments Tech conference
- 2016 Bronze Medal for academic excellence from MSRIT (M.S. Ramaiah Institute of Technology)
- 2015 Won the Texas Instruments Circuit Analysis Competition at MSRIT
- 2012 Awarded Scholarship for Higher Education for being within top 1% in Senior School Certificate Examinations

## TEACHING

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- *Lecturer, ECE 559, Fall 2020* - I was the Faculty Lecturer for VLSI Design Purdue ECE 559, a graduate level class of about 40 students (in person and remote from several countries around the globe). Worked with a teaching assistant for the lab component associated with the course. The role included teaching responsibilities, lab responsibilities, developing the course material and grading.
- *Lecturer, ECE 264, Summer 2018* - I was the Lecturer for Advanced C Programming (Purdue ECE 264) handled a class of about 35 undergraduate students. The role included teaching responsibilities, lab responsibilities, developing the course material and grading.
- *Head TA, ECE 362, Spring 2018 - Spring 2020* - I was the Teaching Assistant for Microprocessor System Design (Purdue ECE 362) in non-summer semesters. I was the Head Teaching Assistant from Fall 2018 - Spring 2020 where I managed 3 other graduate TAs, about 20 undergraduate TAs and developed the lab material for the course. I also developed a web based ARM Cortex M0 simulator for student use.

## TALKS

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- 2025 “Towards Trustworthy AI: Understanding Memorization and Privacy in Deep Learning”, CoCoSys Liaison Talk, Aug 14 2025.
- 2025 “Memorization and Privacy in Deep Learning: A Dataset-Centric Study via Input Loss Curvature”, CoCoSys Annual Review, March 2025.
- 2024 “Learning to Forget: How, What and Why?”, Collins Aerospace, RTX, Nov 2024.
- 2024 “Dataset Integrity: A Curvature Perspective”, CoCoSys SRC Jump 2.0 Center Theme Meeting, August 2024.
- 2020 “TREND: Transferability based Robust ENsemble Design”, Center for Brain Inspired Computing Review 2020.

## SERVICE

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- Reviewer for ICML ‘24 - ‘26, NeurIPS ‘24 - ‘25, WACV ‘25 - ‘26, ICLR ‘25 - ‘26, AISTATS ‘25 - ‘26, CVPR ‘25 - ‘26, ICCV ‘25, ECCV ‘26, BMVC ‘25 - ‘26, AAAI ‘26, ICEdge ‘25.
- Reviewer for IEEE Transactions on Signal Processing, IEEE Transactions on Neural Networks and Learning System, Transactions on Machine Learning Research (TMLR).
- Edited Chapter 3 of the textbook, “Introduction to Probability for Data Science”, by Prof. Stanley H. Chan.